

Docket 14231-2

23

PATENT

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Title: "BODY SENSING SYSTEM"

Commissioner for Patents

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Clean Version Of Claims

1. A system for performing one or more relevant measurements at a target site in an animal body, the system comprising:

a probe that can be inserted into a body adjacent to or within a target site and that comprises a plurality of sensors drawn from:

a first sensor that measures one or more elastic parameters associated with the target site drawn from a group consisting of a Young's modulus, a bulk modulus and a Poisson's ratio associated with the target site;

a second sensor that measures one or more thermal parameters, drawn from a group consisting of local temperature, thermal conductivity and specific heat capacity associated with the target site;

a third sensor that measures optical reflectance $OR(\lambda;meas)$ of a selected region of the target site for one or more selected wavelength ranges;

a fourth sensor that measures amount of blood flow adjacent to or within the target site;

a fifth sensor that measures interstitial fluid pressure adjacent to or within the target site;

Docket 14231-2

24

PATENT

a sixth sensor that measures at least one of pO₂ and pCO₂ associated with the target site;

a seventh sensor that measures local pH associated with a selected portion of the target site; and

an eighth sensor that measures at least one of an electrical parameter and a bioimpedance parameter associated with a selected portion of the target site;

wherein said probe is configured to measure at least one property drawn from:

a selected characteristic of a margin of the target site;
vascular size associated with the target site; and
vascular density associated with the target site.

2. The system of claim 1, wherein at least one of said plurality of sensor measurements is combined with at least one additional measurement that is drawn from a group of measurements, performed adjacent to or within said target site, consisting of lymph node samples, estimation of target site size, estimation of target site shape, estimation of target site surface roughness and estimation of calcification pattern.

3. The system of claim 1, wherein at least one of said plurality of sensor measurements is combined with at least one additional information item that is drawn from a group consisting of (1) at least one medical condition that said animal has exhibited and (2) at least one medical condition that a family member of said animal has exhibited.

4. The system of claim 19, wherein, when at least one of said sensors provides a measurement value that is non-normal and does not fall within said corresponding range of values for said normal target site, said database and analyzer provides at least one disease or malady of said target site that is consistent with at least one of the sensor non-normal measurement values.

Docket 14231-2

2 5

PATENT

5. The system of claim 19, wherein said analyzer comprises a neural net device that receives and processes said measurement from said plurality of sensors and provides at least one processed measurement value that can be compared with said corresponding range of values for said normal target site.

6. The system of claim 5, wherein said neural net device performs a radial basis neural network analysis.

7. The system of claim 5, wherein said neural net device performs a backpropagation neural network analysis.

8. The system of claim 1, wherein at least one of said plurality of sensors is used to navigate said probe to a selected location adjacent to or within said target site.

9 A method for performing one or more relevant measurements at a target site in an animal body, the method comprising:

providing a probe that can be inserted into a body adjacent to or within a target site and that comprises a plurality of sensors drawn from:

a first sensor that measures one or more elastic parameters associated with the target site drawn from a group consisting of a Young's modulus, a bulk modulus and a Poisson's ratio associated with the target site;

a second sensor that measures one or more thermal parameters, drawn from a group consisting of local temperature, thermal conductivity and specific heat capacity associated with the target site;

a third sensor that measures optical reflectance $OR(\lambda; meas)$ of a selected region of the target site for one or more selected wavelength ranges;

a fourth sensor that measures amount of blood flow adjacent to or within the target site;

Docket 14231-2

26

PATENT

a fifth sensor that measures interstitial fluid pressure adjacent to or within the target site;

a sixth sensor that measures at least one of pO₂ and pCO₂ associated with the target site;

a seventh sensor that measures local pH associated with a selected portion of the target site; and

an eighth sensor that measures at least one of an electrical parameter and a bioimpedance parameter associated with a selected portion of the target site;

where wherein said probe is configured to measure at least one property drawn from:

a selected characteristic of a margin of the target site;

vascular size associated with the target site; and

vascular density associated with the target site.

10. The method of claim 9, further comprising combining at least one of said plurality of sensor measurements with at least one additional measurement, performed adjacent to or within said target site, consisting of lymph node samples, estimation of target site size, estimation of target site shape, estimation of target site surface roughness and estimation of calcification pattern.

11. The method of claim 9, further comprising combining at least one of said plurality of sensor measurements with at least one additional information item that is drawn from a group consisting of (1) at least one medical condition that said animal has exhibited and (2) at least one medical condition that a family member of said animal has exhibited.

12. The method of claim 18, further comprising:

when each of at least one of said sensors provides a measurement value that is non-normal and does not fall within said corresponding range of values for said normal target site, said computer is programmed to provide at least one disease or

Docket 14231-2

27

PATENT

malady of said target site that is consistent with at least one of the sensor non-normal measurement values.

13. The method of claim 20, further comprising providing said analyzer with a neural net device that receives and processes said measurement from at least one of said plurality of sensors and provides a processed measurement value that can be compared with said corresponding range of values for said normal target site.

14. The method of claim 13, further comprising choosing said neural net device to perform a radial basis neural network analysis.

15. The method of claim 13, further comprising choosing said neural net device to perform a backpropagation neural network analysis.

16. The method of claim 9, further comprising using at least one of said plurality of sensors to navigate said probe to a selected location adjacent to or within said target site.

17. The system of claim 1, wherein at least one of said plurality of sensors is said third sensor that measures said optical reflectance, using at least one optical fiber that transports an image of a selected portion of said selected region of said target site.

18. The method of claim 9, further comprising providing, as at least one of said plurality of sensors is said third sensor and measuring said optical reflectance by using at least one optical fiber that transports an image of a selected portion of said selected region of said target site.

19. The system of claim 1, further comprising a database and analyzer that receives and compares each of said measurements made by said probe with a

Docket 14231-2

2 8

PATENT

corresponding range of values that is representative of a normal target site and, for at least one of said sensor measurements that is non-normal and does not fall within the corresponding range of values for a normal target site, the database and analyzer provides at least one medical condition of said target site that is generally consistent with the sensor non-normal measurement.

20. The method of claim 9, further comprising providing a database and analyzer, including a computer that is programmed to receive and compare each of said measurements made by said probe with a corresponding range of values that is representative of a normal target site and, for at least one of said sensor measurements that is non-normal and does not fall within the corresponding range of values for a normal target site, the database and analyzer provides at least one medical condition of said target site that is consistent with the non-normal sensor measurement.

41. The system of claim 19, wherein said database and analyzer receives and compares first and second sensor measurements made by said probe with first and second measurement ranges, respectively; for a normal site and, when said first and said second sensor measurements are non-normal and do not fall within corresponding first and second measurement ranges, respectively, for a normal site, said database and analyzer (i) provides first and second medical conditions that are consistent with said first and second sensor non-normal measurements, respectively, and (ii) determines if a third medical condition is present that is consistent with the first medical condition and with the second medical condition.

42. The method of claim 20, comprising further programming said computer to receive and compare first and second sensor measurements made by said probe with first and second measurement ranges, respectively, for a normal site and, when said first and said second sensor measurements are non-normal and do not fall within corresponding first and second measurement ranges, respectively, for a

Docket 14231-2

29

PATENT

normal site, (i) to provide first and second medical conditions that are consistent with said first and second sensor non-normal measurements, respectively, and (ii) to determine if a third medical condition is present that is consistent with the first medical condition and with the second medical condition.

43. The system of claim 1, wherein at least one of said sensor measurements is combined with at least one additional measurement that is drawn from a supplemental group of measurements, performed adjacent to or within said target site; consisting of lymph node samples, mammograms, ultrasound scans, NMRI scans, CAT scans, estimation of target site size, estimation of target site shape, estimation of target site surface roughness and estimation of calcification pattern, further comprising a database and analyzer that receives and analyzes the at least one supplemental group measurement using fuzzy logic.

44. The system of claim 1, wherein at least one of said sensor measurements is combined with at least one additional measurement that is drawn from a group of measurements, performed adjacent to or within said target site, consisting of mammograms, ultrasound scans, NMRI scans and CAT scans.

45. The method of claim 9, further comprising:
combining at least one of said sensor measurements with at least one additional measurement, performed adjacent to or within said target site, consisting of lymph node samples, estimation of target site size, estimation of target site shape, estimation of target site surface roughness and estimation of calcification pattern;
and

providing a database and analyzer that receives and analyzes the at least one supplemental group measurement using fuzzy logic.

46. The method of claim 9, further comprising combining at least one of said sensor measurements with at least one additional measurement, performed adjacent

Docket 14231-2

3 0

PATENT

to or within said target site, consisting of mammograms, ultrasound scans, NMRI scans and CAT scans,.

47. A system for performing one or more relevant measurements at a target site in an animal body, the system comprising:

a probe that can be inserted into a body adjacent to or within a target site and that comprises at least one of a group of sensors drawn from:

a first sensor that measures one or more elastic parameters associated with the target site drawn from a group consisting of a Young's modulus, a bulk modulus and a Poisson's ratio associated with the target site;

a second sensor that measures one or more thermal parameters, drawn from a group consisting of local temperature, thermal conductivity and specific heat capacity associated with the target site;

a third sensor that measures optical reflectance $OR(\lambda;meas)$ of a selected region of the target site for one or more selected wavelength ranges;

a fourth sensor that measures amount of blood flow adjacent to or within the target site;

a fifth sensor that measures interstitial fluid pressure adjacent to or within the target site;

a sixth sensor that measures at least one of pO_2 and pCO_2 associated with the target site;

a seventh sensor that measures local pH associated with a selected portion of the target site; and

an eighth sensor that measures at least one of an electrical parameter and a bioimpedance parameter associated with a selected portion of the target site; and

a database and analyzer that receives and compares each of the measurements made by the probe with a corresponding range of values that is representative of a normal target site and, for at least one of the sensor measurements that is non-normal and does not fall within the corresponding range

Docket 14231-2

3 1

PATENT

of values for a normal target site, the database and analyzer provides at least one medical condition of said target site that is generally consistent with the sensor non-normal measurement.

48. The system of claim 47, wherein at least one of said first group of sensor measurements is combined with at least one additional measurement that is drawn from a group of measurements, performed adjacent to or within said target site, consisting of lymph node samples, estimation of target site size, estimation of target site shape, estimation of target site surface roughness and estimation of calcification pattern.

49. The system of Claim 47, wherein, when at least one sensor provides a measurement value that is non-normal and does not fall within said corresponding range of values for the normal target site, the database and analyzer provides at least one disease or malady of the target site that is consistent with at least one of the sensor non-normal measurement values.

50. A method for performing one or more relevant measurements at a target site in an animal body, the method comprising:

providing a probe that can be inserted into a body adjacent to or within a target site and that comprises at least one of a group of sensors drawn from:

a first sensor that measures one or more elastic parameters associated with the target site drawn from a group consisting of a Young's modulus, a bulk modulus and a Poisson's ratio associated with the target site;

a second sensor that measures one or more thermal parameters, drawn from a group consisting of local temperature, thermal conductivity and specific heat capacity associated with the target site;

a third sensor that measures optical reflectance $OR(\lambda; meas)$ of a selected region of the target site for one or more selected wavelength ranges;

Docket 14231-2

3 2

PATENT

a fourth sensor that measures amount of blood flow adjacent to or within the target site;

a fifth sensor that measures interstitial fluid pressure adjacent to or within the target site;

a sixth sensor that measures at least one of pO₂ and pCO₂ associated with the target site;

a seventh sensor that measures local pH associated with a selected portion of the target site; and

an eighth sensor that measures at least one of an electrical parameter and a bioimpedance parameter associated with a selected portion of the target site; and

providing a database and analyzer that receives and compares each of the measurements made by the probe with a corresponding range of values that is representative of a normal target site and, for at least one of the sensor measurements that is non-normal and does not fall within the corresponding range of values for a normal target site, the database and analyzer provides at least one medical condition of said target site that is generally consistent with the sensor non-normal measurement.

51. The method of claim 50, further comprising combining at least one of said first group of sensor measurements with at least one additional measurement that is drawn from a group of measurements, performed adjacent to or within said target site, consisting of lymph node samples, estimation of target site size, estimation of target site shape, estimation of target site surface roughness and estimation of calcification pattern.

52. The method of claim 50, wherein, when at least one sensor provides a measurement value that is non-normal and does not fall within said corresponding range of values for the normal target site, the database and analyzer provides at least

Docket 14231-2

3 3

PATENT

one disease or malady of the target site that is consistent with at least one of the sensor non-normal measurement values.